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Section Editor: Steve Levine, MD

Approach to Acute Dizziness/Vertigo in the Emergency Department: Selected Controversies Regarding Specialty Consultation

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ABSTRACT: Acute dizziness and vertigo are common emergency department presentations (≈4% of annual visits) and sometimes, a life-threatening diagnosis like stroke is missed. Recent literature reviews the challenges in evaluation of these symptoms and offers guidelines for diagnostic approaches. Strong evidence indicates that when well-trained providers perform a high-quality bedside neurovestibular examination, accurate diagnosis of peripheral vestibular disorders and stroke increases. However, it is less clear who can and should be performing these assessments on a routine basis. This article offers a focused debate for and against routine specialty consultation for patients with acute dizziness or vertigo in the emergency department as well as a potential path forward utilizing new portable technologies to quantify eye movements.

Key Words: dizziness ■ emergency medicine ■ inner ear ■ stroke ■ vertigo

Stroke

Acute dizziness and vertigo (hereafter referred to as dizziness) are common presentations in the emergency department (ED), accounting for ≈4% of all visits.[1] Distinguishing the more common peripheral syndromes from central mimics is important but challenging, as symptoms are often indistinguishable (vertigo, nausea, vomiting, and unsteady gait for both), and bedside signs can be subtle. Rarely, even isolated vertigo is not benign with 0.7% of presentations due to central ischemic events.[2] Careful history-taking and physical exam, including detailed neurological and ocular motor examination of nystagmus patterns, vestibulo-ocular reflexes, and eye alignment can accurately discriminate inner ear disease from a stroke.[2,3] However, many emergency physicians (EPs) are either unfamiliar or lack confidence in performing some of these exam techniques.[4] Atzema et al[5] found a 0.18% potential stroke/transient ischemic attack miss rate, defined as stroke admission within 30 days of an index ED visit ending in discharge as a benign, peripheral disorder in a Canadian cohort. A Texas-based study of patients >45 years (n=1245) reported a 1.2% subsequent stroke rate among those not initially diagnosed as stroke, an unknown proportion of which were potentially preventable at the index visit.[6] When the denominator is strokes (rather than benign dizziness discharges), rates of missed stroke are naturally higher.[7] A systematic review found a 39% false negative rate for those presenting with dizziness or vertigo.[8] Neuroimaging is the principal alternative to bedside examination, but the more accessible computed tomography is insensitive for posterior circulation stroke. Although delayed magnetic resonance imaging (MRI; at 3–5 days[9]) is the current gold standard, early MRI may miss 1 in 5 strokes.[10] These diagnostic challenges beget an important question, and the focus of this debate—should all patients in the ED with dizziness be assessed by a neurologist? This is not a comprehensive literature review—instead a contribution to the discussion surrounding the challenges

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in acute assessment of this particular symptom/patient population.

(PRO) Multidisciplinary Care Is Best: All ED Patients With Vertigo Should See a Neurologist

The routine assessment of dizzy patients by a neurologist is critical for safe care. Diagnostic excellence is widely recognized as an essential tenet for patient safety[11] and missed stroke is the top ED clinical condition associated with serious misdiagnosis-related harms.[12] In 1 cross-sectional study, ED providers missed 35% of transient ischemic attack/patients with stroke (16 of 46) presenting with dizziness symptoms.[2] Misdiagnosis rates are higher for posterior circulation stroke syndromes,[13] which often manifest with nontraditional symptoms, can be missed by routine screening evaluations such as the National Institutes of Health Stroke Scale, and have an overall greater complexity of bedside assessment. There is potential for substantial harm. One retrospective review of an inpatient stroke registry found 30% mortality from missed stroke (a composite of all vascular distributions),[14] and a single center review of 15 cases found 40% mortality in missed cerebellar syndromes (12 had acute dizziness and vertigo and 2 had unsteadiness).[15]

These realities necessitate providing ED physicians better resources to improve diagnostic accuracy in the busy, chaotic, and overcrowded ED environment.[16] While stroke misdiagnosis may be partially influenced by ED practitioner–related factors, it is superseded by another more important factor—namely, access to neurologists.[12] We will discuss why neurology assistance is essential, and why this need is unlikely to change anytime soon.

First: Two Physicians Are Better Than One, and Involving Neurologists Misses Fewer Strokes

There is a robust body of evidence showing overall better stroke diagnosis and outcomes when neurologists are involved.[12–14,17] This may be attributed to greater neurological expertise, but may also be influenced by the availability of more information, resources, or the synergistic effect of collective intelligence (collaborative physicians performing parallel evaluations of patients, which has been established to enhance diagnostic accuracy).[18] In a retrospective review of patients discharged with a diagnosis of ischemic stroke, neurological consultation was associated with greater stroke diagnostic accuracy, with 95% (213 of 225) correctly diagnosed stroke cases with neurologist involvement.[13] Among stroke chameleons (patients with ischemic stroke mistaken as another diagnosis), ED physicians did not consider a stroke diagnosis in 91.5% (43 of 47); 29 of the 43 initially missed strokes were evaluated by a neurology resident, who correctly identified the stroke in 48.3% (14 of 29).[14] While these studies are limited by small sample sizes and may be prone to selection or indication bias, they collectively suggest greater overall diagnostic accuracy when a neurologist is part of the team assessing potential stroke patients.

Second: The Typical EP May Not Be Well-Trained Neurovestibular Evaluation

Great variability exists in emergency medicine (EM) residency training programs regarding education in neurological emergencies.[18] The most recent survey data available suggests only 52.1% (25 of 48) EM residency programs had required neurology rotations[19] and 12±5.6 hours per year of neurological didactic sessions—felt by some consensus groups as being contributory to variations in care (ie, neurological exam performance and documentation, missed cases, treatment decisions).[19] This is in contrast to EM trauma education, in which most training programs have a dedicated rotation (or rotations), multidisciplinary didactic hours, logged resuscitations/procedures, and advanced trauma life support training.[19] Thus, augmentation of EM residency training in the neurological domain merits strong consideration to improve diagnostic accuracy by frontline physicians.

A portion of EM providers likely desire help from neurologists in performing the exam techniques required. EPs may lack confidence with both positional testing and the Head Impulse, Nystagmus, Test of Skew exam,[4] and these tests are often misapplied or misinterpreted.[20,21] Recent EM guidelines have also recommended EPs obtain specific training for the assessment of dizzy patients.[22] Given higher misdiagnosis rates and the potential for devastating outcomes in missed posterior stroke syndromes,[23] there is also litigation risk for EPs with failure to timely refer to a specialist (typically a neurologist) being an allegation in 22% of malpractice cases.[23] Thus, there is a clear medicolegal risk if neurological support is not provided.[23]

Third: Fully Training All EPs Will Not Happen Any Time Soon

While it is theoretically possible to train the nation's EPs in how to perform key components of these specialized evaluations, enthusiasm is dampened by numerous other burdens, including other training obligations.[24] No existing, validated training program, particularly for postgraduate practicing clinicians, is currently available, and training all in the nation's EDs would be an enormous undertaking. Thus regrettably, until such training is incorporated, neurological assistance will remain compulsory.

Closing Statement

In closing, the current state in which patients with vertigo are evaluated by EPs without neurological assistance is higher risk, lower quality, and less sustainable. EPs need help in this current crisis of ED overcrowding and boarding. With the wider accessibility of novel telehealth

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 Stroke. 2024;55:00–00. DOI: 10.1161/STROKEAHA.123.043406

platforms,[25] and in the context of established stroke systems, why not provide it?[26,27]

(CON) Impossible and Unnecessary: Most ED Patients With Vertigo Cannot and Need Not Be Assessed by a Neurologist

All clinicians and patients share the goal of accurate diagnosis and avoiding misdiagnosis. It is tempting, therefore, to argue for an extensive workup and increased testing and consultation across the board. However, the routine assessment of all ED patients with dizziness by a specialist is both impossible and unnecessary. Further, it is likely only a small proportion of ED patients with dizziness will have a stroke for which a disabling outcome could have been prevented had acute stroke treatment(s) been given.

First: There Are Too Many Dizzy Patients and Not Enough Specialists

Approximately 4.8 million dizzy patients present to EDs across the United States each year.[28] As many as one-fifth (19%) of these encounters occur at the 42% of EDs located in rural locations.[29] These EDs may be staffed by non-EM-residency trained providers where few have 24/7 MRI capabilities and access to a neurologist is rarer still.[17] The neurology workforce, concentrated in urban settings and large academic centers, cannot evaluate all of the ED dizzy patients, either now or for the foreseeable future.

In the United States, there are ≈67 000 ED providers, including over 46 000 EM-trained physicians, and ≈5000 non–EM-trained physicians.[30] In contrast, there are fewer than 14 000 neurologists in the United States.[30] Many of these neurologists do not provide ED consultative services, few are available 24/7, and the majority do not subspecialize in eye movements, dizziness, or vertigo. The exact number of oto-neurologists in the United States is not known but is likely fewer than 100, since they are substantially outnumbered by otolaryngology-trained neuro-otologists, who number fewer than 500;[31] even if neurology-trained neuro-ophthalmologists are also considered, they number fewer than 250 with large geographic dead zones.[32]

The sheer numbers are daunting. There are too many dizzy patients and too few specialists not well geographically distributed.

Second: EPs Are as Good at This Job as Any Specialist Would Be

The current process of initial diagnostic evaluation by EPs, followed by specialty consultation for the small proportion with high-risk features, generally works well. Through careful physical exam and appropriate use of diagnostic testing, EPs routinely rule out serious causes for a wide range of conditions.

Dizziness is not a special presentation. It is a highly prevalent, nonspecific symptom due to varied causes, often general medical disorders.[33] Among patients presenting with dizziness, only about 4% have a cerebrovascular cause of their presentation.[34] This means whoever sees these patients should have the training and expertise to evaluate them for a range of conditions, not limited to neurological or vestibular disorders. An estimated 80% to 85% of dizzy patients will ultimately have a benign cause of their presentation[33] and fewer than 1% of those suffer a serious vascular event or death in the subsequent 6 months.[35]

It is unclear if routine specialty consultation would change these numbers. No one is comfortable with missing a stroke, but the question here is whether calling the average available neurologist to the average ED would efficiently and effectively add diagnostic certainty for the average patient. It is unclear if the typical neurologist can perform a high-quality neurovestibular exam (in a busy ED) any better than a trained EP. At least 1 study suggests general neurologists are far from perfect in the ED setting, erroneously calling 12% (n=7/52) of ischemic strokes benign vestibular disorders at initial ED presentation.[36] Those same neurology consultants erroneously overcalled a stroke diagnosis in 36% (n=25/70) of those without stroke.[36] Another study showed that 35% of strokes missed by an EP at an academic hospital were missed by the consulting neurologist as well.[13]

EPs with appropriate training are the right specialists to perform the initial evaluation of patients presenting with dizziness. We agree dedicated training in eye movements is critical; there is no reason EPs cannot be just as well trained for this as anyone else. A recent systematic review found that trained EPs using the Head Impulse, Nystagmus, Test of Skew exam were equally sensitive to detecting central causes of dizziness as subspecialists, with comparable specificity.[3] As a young specialty that has become adept at integrating techniques and procedures traditionally performed by other specialties, there is no reason not to add this particular skill set to the EP toolbox.[22]

Closing Statement

In closing, EPs in current practice miss some strokes presenting as dizzy, but there is no neurology consultant workforce both widely available and proven to do better in the ED setting. As the cost of dizziness evaluations continues to rise, the use of complicated, expensive, and impossible-to-implement approaches cannot be the answer. Whether it be better training in the vestibular exam, advanced technology to evaluate eye movements (video-oculography), or specific biomarkers, the optimal future with the lowest miss rate across the broadest range of ED settings lies in focusing on EPs and providing them with the necessary knowledge and tools.

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Summary

The problem of evaluating dizziness in the ED both accurately and efficiently is a real-world challenge. Although overall serious harm rates after missed stroke are low in ED dizziness (<1%), the absolute number of patients affected may be in the range of 15 000 to 25 000 per year in the United States alone.[35] Another ≈1 million inner ear patients may be misdiagnosed, missing key treatment opportunities to alleviate suffering.[35] Methods leveraging bedside eye movement exams to definitively diagnose the more common, benign inner ear disorders (benign paroxysmal positional vertigo and vestibular neuritis), have been described and their use by trained clinicians is now endorsed by a major EM society guideline.[22] However, these techniques are unfamiliar to the vast majority of EPs and many neurologists. Subspecialists with training and expertise in vestibular medicine are competent and comfortable using these techniques, but they likely number fewer than 500 in the United States. We need another solution, but is it routine neurology consultations?

The pro team has argued patient safety is paramount, EPs are not well positioned to use eye movements for high-stakes diagnostic or disposition decisions, and neurologists are much better positioned to do so. The con team has rebutted the current system exists for a good reason, appealing to the existing consultative model is likely to yield unimpressive (and needlessly expensive) results, and EPs are perfectly capable of learning eye movements for diagnosis, as they have learned other new techniques in the past. How can we reconcile 2 well-justified, opposing positions to address this important, public health conundrum?

Making diagnostic expertise in dizziness evaluation universally accessible will likely require a multifaceted solution—one that (1) builds the bedside diagnostic expertise of frontline clinicians (training), (2) supports their endeavors with appropriate feedback for quality assurance and calibration on diagnostic accuracy (tuning); (3) offers access to specialists or subspecialists for challenging cases (teamwork); (4) leverages machine learning algorithms for decision support to extend and scale the process (technology); and (5) designs studies and randomized controlled trials (RCTs) to assess the effectiveness and clinical impact of implementation of these proposed strategies (testing). Stroke risk stratification may be aided by baseline health risks (eg, vascular risk factors), exam techniques (eg, assessment of gait), or clinical pathways (eg, standing protocol),[37] but one essential element is needed to facilitate accurate diagnosis at scale—the bedside assessment and quantification of eye movements.[37] A viable option meriting strong consideration is the deployment of portable bedside video-oculography in the ED.[37] While limitations and barriers exist in the dissemination of any new technology (ie, cost, training, operation, interpretation, etc), this approach offers a promising pathway to implementation that is likely achievable and could help us meet these 5T goals.

ARTICLE INFORMATION

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Sources of Funding

Dr Newman-Toker was partly supported by Agency for Healthcare Research and Quality grant R18HS029350 and the Armstrong Institute Center for Diagnostic Excellence. Dr Goldstein is supported by grant funding from the National Institutes of Health.

Disclosures

Dr Goldstein is a consultant for AstraZeneca, Cayuga, CSL Behring, Lumosa, NControl, Octapharma USA Inc, Pfizer, and Takeda Medical Research Foundation. Dr Newman-Toker is an inventor on a provisional patent (US No. 62/883,373) for smartphone-based stroke diagnosis in patients with dizziness. The other authors report no conflicts.

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